Effectiveness of Planned Health Education Program on Nurses' Knowledge and Practice for Preventing Infection in Gastrointestinal Endoscopy Units at Major Hospitals in Yemen

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Abstract: *The Most hospital-acquired infections are transmitted by health care personnel who fail to practice proper hand hygiene or who fail to change gloves between client contacts. Infection control is an issue wherever the client may be found, not just in the acute hospital.*
Aim of the study: *The study aimed to evaluate the effectiveness of planned health education program on nurses' knowledge and practice for preventing infection in gastrointestinal endoscopy units at major hospitals in Yemen.* ***Methods:*** *The Quasi-experimental (One group pre-test and post-test design) research design was used in this study. Purposive sample included all available (46) nurses. Tools used for data collection included self-administered questionnaire, an observation checklist.*
Results: *The mean age of the nurses were 30.087± 4.74143 years, about two thirds were female and 58.7% had diploma degree. The most obstacle to implementation infection control was inadequate resources 69.6%. There was significant improvement in total scores and all items of knowledge and practice regarding infection prevention and control measures before and after applying health education program. After implementation of health education program, the nurses had 78.3% adequate knowledge and 67.4% good practice.*
Conclusion: *Planned health education program was effective in improving nurses knowledge and practice of nurses regarding infection prevention and control measures and endoscopy reprocessing at endoscopy units.*
Recommendations: *Continuous educational and training is for all health team members in endoscopy units about infection prevention and control.*
Keywords: *Endoscopy, Infection Prevention and Control, Knowledge, Practice.*

I. Introduction

Flexible endoscopes are complex instruments with not only an external surface, but also internal channels (e.g., suction/biopsy, elevator channels, and air/water) and accessories that are exposed to body fluids and other contaminants [1]. Infections prevention associated with endoscopy is complex and needs meticulous attention to detail. Practical limitations of applying recognized sterilizing and high-level disinfection processes to endoscopes must be understood, as must the mechanisms of infection and the organisms which provide the greatest clinical risks [2]. Endoscopy related infection may occur under the following circumstances: (1) microorganisms may spread from the gastrointestinal tract via the bloodstream during an endoscopy to susceptible organs or prostheses, or may spread to adjacent tissues that are breached as a result of the endoscopic procedure (endogenous infections), (2) microorganisms may be spread from patient to patient by contaminated equipment (exogenous infections), or (3) microorganisms may be transmitted from patients to endoscopy personnel and perhaps from endoscopy personnel to patients [3]. The best method of infection control is prevention, which is successful when the chain of infection is broken successfully [4].

Appropriate reprocessing of endoscopes and accessories is critical to the successful and safe treatment of patients [5], and it is an essential part of quality assurance and safety in gastrointestinal endoscopy [6]. Automatic flexible endoscope reprocessors are widely used but the numerous problems associated with these machines are often inadequately addressed. Part of any quality control program must be adequate microbiological surveillance of endoscopes [2]. Training is an important factor in infection prevention and safety. In any area where gastrointestinal endoscopy is performed all staff must adhere to infection prevention and control [7]. Infection prevention and control of endoscopes can be improved by implementing quality improvement activities in routine endoscopy practice [8].

II. Subjects and Method

The study aimed to evaluate the effectiveness of planned health education program on nurses' knowledge and practice for preventing infection in gastrointestinal endoscopy units at major hospitals in Yemen.

Research Design:
The Quasi-experimental research design was used in this study (One group pre-test and post-test design).

Research Question:
The following three research questions were formulated to achieve the aim of the current study:

1. What are levels of nurses' knowledge about infection prevention measures at endoscopy units of a major hospitals, Sana'a-Yemen?
2. What are levels of nurses' practices of infection prevention measures at endoscopy units of major hospitals, Sana'a-Yemen?
3. Is there any difference in nurses' knowledge and practice pre and post implementing the program?

Setting:
The study was conducted in the gastrointestinal endoscopy unit at major hospitals (Thawra Modern General Hospital, Al-Kuwait University Hospital, and Al-Gomhory General hospital) in Sana'a- Yemen.

Sample:
A Purposive sample include all available
(46) nurses in the endoscopy units.

Tools for Data Collection:
Tool I: was a structured interview questionnaire: This questionnaire consists of three parts: *Part I:* Was a sociodemographic Characteristics. *Part II:* Was a to assess the obstacles and availability measures in the endoscopy units to prevent infection. *Part III*: Was a nurses' knowledge questionnaire to assess the nurse's knowledge in relation to application of infection prevention and control measures in endoscopy unit. **Tool II:** Was an observation checklist to evaluate nurses' practice of infection prevention and control measures.

Approval was obtained from ethical committee of faculty of nursing Mansoura University and official written permission from authorities of gastrointestinal endoscopy units at major hospitals (Al-Thawra Modern General Hospital, Al-Kuwait University Hospital, and Al-
Gomhory General Hospital) in Sana'a- Yemen.

Scoring system:
Each correct answer scored one point and each incorrect answer scored a zero. A higher score indicated a greater nurse's knowledge. The score obtained for each question summed up get the total score for the nurse's knowledge. The nurses' knowledge was considered adequate knowledge if the percent score above 70%, moderately adequate knowledge if 51-75%, and inadequate knowledge below than50%.

For procedure steps was done correctly scored two point, if need correction scored one point and if not done scored zero. The nursing practice was considered good practice if the percent score above 75%, fair practice if 51-75%, and poor practice if below than 50%.

Ethical consideration:
The consent was taken orally from all nurses participated in the study. The researcher explained purpose of the study through direct personal communication they were secured that data will be confidential and will be used for the research purpose only.

Field of the work
The field work was started from from first of July 2014 to the end of December 2014; one group pre-test and post-test design. A program was implemented Moreover, an instructional booklet was given to each nurse's in to attract their attention, motivate them and help for reviewing at ward, home and support teaching and practice.

Statistical analysis:
Data were collected, computed and statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 16.0.0.0 for continuous variables (mean ±SD) which was used for comparisons and t test, paired t test, ANOVA t tests were used for the detection of significant differences for the independent group, same group (pre& post) and more than two groups respectively. Pearson's correlation coefficient was used to test correlation between variables. The 0.05 level was used as the cut off value for statistical significance.

III. Results

Table (1): Shows the distribution of study sample according to sociodemographic characteristics. It revealed that the most of nurses 67% age less than 30 years. More than half was female, had nursing diploma 58.7% and 67.4% of them had 5 to less than 10 years.

Table (2): Shows distribution of the obstacles to implement infection prevention measures in gastrointestinal endoscopy units. It can be observed that the most obstacles to implementation infection prevention and control was inadequate resources 69.6% and 58.7% overcrowded patients, while the minority 23.9% was unqualified nurses.

Table (3): Shows the comparison between pre-intervention, immediate post-intervention, and after 3 months regarding infection prevention measures knowledge among nurses. The table shows that the total scores and all items of knowledge regarding infection control prevention measures was significant difference before and immediate after applying health education program. Moreover, the total scores and all items of knowledge regarding infection control prevention measures was significant difference before and after three months from applying health education program.

In addition, there were significant difference between immediate post-intervention and 3 months after applying health education program in total score and all items regarding infection control prevention measure.

Table (4, 5&6): Shows the comparison between pre-intervention, immediate post-intervention, and post three months regarding universal precaution practice, precaution practice, and repressing of endoscope and their accessories practice. It revealed that all items of practice regarding universal precaution, precaution practice, and repressing of endoscope was statistical significant difference before and immediate after applying health education program. Moreover, the all items of practice regarding universal precaution, precaution practice, and repressing of endoscope was significant difference before applying health education program and after three months from applying health education program.

In addition, there were no significant difference between immediate after applying health education program and after three months from applying health education program except in gowning, precaution spills, pre-cleaning, manual cleaning, and manual disinfecting there was significant difference.

Table (7): Shows distribution of sample according to their knowledge grades. It noticed that the most of nurses 67.4% had inadequate knowledge before applying health education program and 8.7% of them had adequate knowledge, while immediate after applying health education program the nurse's knowledge grades were adequate 78.3% and 6.5% of them were inadequate knowledge. Moreover, after three months of applying health education program the most of nurse's knowledge grades were 82.6% moderate adequate knowledge and 2.2% of them were adequate knowledge.

Table (8): Shows distribution of sample according to their practice grades. It indicates that the most of nurses 67.4% had poor practice before applying health education program and 32.6% of them had fair practice, while immediate after applying health education program the nurses practice was good practice 67.4% and 8.7% of them were poor practice. Moreover, after three months of applying health education program the nurses practice was good practice 76.1% and 6.5% of them were poor practice.

Table (9): Shows the correlation between total Knowledge and total practice of the nurses before and after intervention. It revealed that there was moderate positive relationship (r=0.40-0.59) between 'pre-intervention and immediate post-intervention' and pre-intervention and post 3 months knowledge, while there was weak relationship (r=0.20-0.39) between Immediate post-intervention and post 3 months knowledge. There was no relationship (negligible) between knowledge and practice before and after intervention were Pearson Correlation Coefficient (r= -0.20‑ -0.39>0.33).

Table (1): **Distribution of study sample according to sociodemographic characteristics. (No=46)**

Items	Number (46)	Percentage %
Age Group		
<30	31	67.4
30-<40	11	23.9
>40	4	8.7
Mean & SD	Mean 30.087	SD ± 4.74143
Sex		
Male	15	32.6
Female	31	67.4
Educational Level		
Bachelors	4	8.7
Diploma	27	58.7
Secondary Nursing School	15	32.6
Experiences years		
<5years	10	21.7
5-<10years	31	67.4
10-<15years	5	10.9

Table (2): **Distribution of the obstacles to implement infection prevention measures in gastrointestinal endoscopy units. (No=46)**

Items		Number (46)	Percentage %
Inadequate Resources	Yes	32	69.6
	No	14	30.4
Insufficient Staff	Yes	22	47.8
	No	24	52.2
Overcrowded Patients	Yes	27	58.7
	No	19	41.3
Inadequate knowledge	Yes	20	43.5
	No	26	56.5
Unqualified Nurses	Yes	11	23.9
	No	35	76.1
Insufficient Training	Yes	16	34.8
	No	30	65.2

Table (3): **Comparison between pre-intervention, immediate post-intervention, and after 3 months regarding infection prevention measures knowledge among nurse's. N=46**

Items		Pre-intervention	Immediate post-intervention	After 3 months	p1	p2	p3
Med Care Infection Score	Mean	1.282	2.174	1.609	t= 7.602	t=2.185	t=4.456
	±SD	±0.981	±0.709	±0.881	P 0.000*	P 0.034*	P 0.000*
Transmission Infection Score	Mean	2.739	4.7609	4.000	t=11.239	t=5.498	t=3.683
	±SD	±1.237	±1.158	±1.282	P 0.000*	P 0.000*	P 0.001*
Hand Washing Score	Mean	1.370	1.848	1.696	t=4.008	t=3.155	t=1.635
	±SD	±0.679	±0.470	±0.465	P 0.000*	P 0.003*	P 0.109
Protect Equipment Knowledge Score	Mean	3.804	6.152	4.761	t=8.950	t=2.935	t=4.813
	±SD	±1.439	±1.246	±1.479	P 0.000*	P 0.005*	P 0.000*
Environment Clean Knowledge Score	Mean	2.652	4.348	3.565	8.431	t=4.339	t=4.089
	±SD	±1.215	±0.994	±0.935	P 0.000*	P 0.000*	P 0.000*
Sharps and Waste Disposal Score	Mean	2. 044	3.391	2.761	t=8.022	t=3.920	t=3.275
	±SD	±1.115	±0.929	±0.899	P 0.000*	P 0.000*	P 0.002*
Occupational	Mean	2.609	4.696	3.587	t=9.068	t=3.889	t=5.304

Items		Pre-intervention	Immediate post-intervention	After 3 months	P¹	P²	P³
Safety Score	±SD	±1.341	±1.380	±1.127	P 0.000*	P 0.000*	P 0.000*
Disinfection Score	Mean	2.848	5.022	3.761	t=10.628	t=3.677	t=5.262
	±SD	±1.316	±1.308	±1.233	P 0.000*	P 0.001*	P 0.000*
Re-management Endoscopy Score	Mean	3.044	5.957	4.717	t=12.894	t=6.301	t=4.692
	±SD	±1.444	±1.398	±1.455	P 0.000*	P 0.000*	P 0.000*
Total Knowledge Score	Mean	22.391	38.348	30.457	t=13.849	t=7.320	t=7.154
	±SD	±7.931	±7.249	±5.443	P 0.000*	P 0.000*	P 0.000*

P^1= Pre-intervention and immediate post-intervention. P^2= Pre-intervention and post 3 months.

P^3= Immediate post-intervention and post 3 months. *= Significant differences at $p<0.05$.

Table (4): Comparison between pre-intervention, immediate post-intervention and post three month regarding universal precaution practice. N=46

Items		Pre-intervention	Immediate post-intervention	After 3 months	P¹	P²	P³
Hand washing	Mean	7.978	11.522	12.522	t=10.010	t=10.211	2.668
	±SD	±3.403	±3.060	±3.205	P 0.000*	P 0.000*	P 0.011
Gloving	Mean	16.044	21.130	22.174	t=10.133	t=9.482	t=1.698
	±SD	±5.850	±6.797	±7.015	P 0.000*	P 0.000*	P 0.096
Gowning	Mean	12.587	18.304	20.783	t=14.249	t=15.853	t=5.307
	±SD	±3.277	±3.602	±2.796	P 0.000*	P 0.000*	P 0.000*
Masking	Mean	8.326	12.326	12.739	t=11.603	t=12.148	t=1.381
	±SD	±2.077	±1.874	±1.763	P 0.000*	P 0.000*	P 0.174
Goggling	Mean	5.217	7.261	7.370	t=11.629	t=9.017	t=0.573
	±SD	±1.191	±0.953	±1.040	P 0.000*	P 0.000*	P 0.569
Personal Hygiene	Mean	10.739	16.565	15.478	t=2.715	t=9.732	t=0.609
	±SD	±2.744	±15.116	±2.648	P 0.009*	P 0.000*	P 0.545

Table (5): Comparison between pre-intervention, immediate post-intervention and post three month regarding health related precaution practice. N=46

Items		Pre-intervention	Immediate post-intervention	After 3 months	P¹	P²	P³
Precaution Linen	Mean	4.544	6.978	6.848	t=14.385	t=11.457	t=0.667
	±SD	±1.242	±1.183	±1.074	P 0.000*	P 0.000*	P 0.508
Precaution Sharps	Mean	2.522	4.174	4.565	t=8.832	t=9.805	t=2.004
	±SD	±1.260	±1.141	±1.205	P 0.000*	P 0.000*	P 0.051
Precaution Biopsy	Mean	3.413	7.391	7.804	t=13.762	t=15.847	t=1.462
	±SD	±2.217	±2.049	±1.881	P 0.000*	P 0.000*	P 0.151
Precaution Spills	Mean	3.109	6.457	7.022	t=11.216	t=13.283	t=2.721
	±SD	±2.003	±1.516	±1.164	P 0.000*	P 0.000*	P 0.009*

Table (6): Comparison between pre-intervention, immediate post-intervention and post three month regarding repressing of endoscope and their accessories practice.

Items		Pre-intervention	Immediate post-intervention	After 3 months	P¹	P²	P³
1. Pre Cleaning	Mean	5.891	12.869	13.826	t=12.406	t=18.850	t=2.204
	±SD	±3.129	±4.220	±3.755	P 0.000*	P 0.000*	P 0.033*
2. Leakage Testing	Mean	6.391	18.500	19.500	t=12.078	t=16.989	t=1.328
	±SD	±7.038	±5.080	±4.314	P 0.000*	P 0.000*	P 0.191

3.	Manual Cleaning	Mean	12.239	22.217	25.130	t=12.625	t=16.056	t=4.404
		±SD	±6.089	±5.781	±4.385	P 0.000*	P 0.000*	P 0.000*
4.	Manual Disinfecting	Mean	10.761	17.065	18.935	t=12.369	t=14.297	t=3.540
		±SD	±3.884	±3.549	±3.165	P 0.000*	P 0.000*	P 0.001*
5.	Endoscope Handling	Mean	2.913	5.000	5.435	t=9.326	t=10.585	t=1.096
		±SD	±1.473	±1.116	±0.958	P 0.000*	P 0.000*	P 0.279
6.	Endoscope Storage	Mean	4.022	8.369	8.674	t=15.617	t=16.923	t=2.379
		±SD	±1.783	±1.925	±1.634	P 0.000*	P 0.000*	P 0.022*
7.	Accessory Disinfect	Mean	4.891	16.435	15.239	t=13.102	t=17.634	t=1.527
		±SD	±1.689	±1.772	±2.099	P 0.000*	P 0.000*	P 0.134
Total practice Score		Mean	101.565	223.174	217.978	t=16.336	t=22.328	t=1.711
		±SD	±8.843	±9.396	±9.502	P 0.000*	P 0.000*	P 0.094

Table (7): Distribution of sample according to their knowledge grades.

Frequency and Percentage	Knowledge Grads								
	Pre-intervention			Immediate post- intervention			After 3 months		
	Inadequate Knowledge	Moderate Adequate Knowledge	Adequate Knowledge	Inadequate Knowledge	Moderate Adequate Knowledge	Adequate Knowledge	Inadequate Knowledge	Moderate Adequate Knowledge	Adequate Knowledge
No	31	11	4	3	7	36	7	38	1
%	67.4	23.9	8.7	6.5	15.2	78.3	15.2	82.6	2.2

Table (8): Distribution of sample according to their practice grades.

Frequency and Percentage	Practice Grads								
	Pre-intervention			Immediate post- intervention			After 3 months		
	Poor Practice	Fair Practice	Good Practice	Poor Practice	Fair Practice	Good Practice	Poor Practice	Fair Practice	Good Practice
No	31	15	0	4	11	31	3	8	35
%	67.4	32.6	0.00	8.7	23.9	67.4	6.5	17.4	76.1

Table (9): Shows the correlation between total Knowledge and total practice of the nurses before and after intervention.

		Correlations					
Items		Knowledge			Practice		
		Pre-intervention	Immediate post-intervention	After 3 months	Pre-intervention	Immediate post-intervention	After 3 months
Pre-intervention	Pearson Correlation	1	0.473**	0.425**	-0.175	-0.292*	-0.137
	Sig. (2-tailed)		0.001	0.003	0.244	0.049	0.364
	N	46	46	46	46	46	46
Immediate post-intervention	Pearson Correlation	.473**	1	0.332*	-0.204	-0.093	-0.121
	Sig. (2-tailed)	.001		.024	0.174	0.537	0.425
	N	46	46	46	46	46	46
After 3 months	Pearson Correlation	.425**	0.332*	1	-0.071	0.062	-0.116
	Sig. (2-tailed)	.003	0.024		0.638	0.683	0.445
	N	46	46	46	46	46	46
Pre-intervention	Pearson Correlation	-0.175	-0.204	-0.071	1	0.622**	0.712**
	Sig. (2-tailed)	0.244	0.174	0.638		0.000	0.000
	N	46	46	46	46	46	46
Immediate post-intervention	Pearson Correlation	-0.292*	-0.093	0.062	0.622**	1	0.575**
	Sig. (2-tailed)	0.049	0.537	0.683	0.000		0.000
	N	46	46	46	46	46	46
After 3 months	Pearson Correlation	-0.137	-0.121	-0.116	0.712**	0.575**	1
	Sig. (2-tailed)	0.364	0.425	0.445	0.000	.000	
	N	46	46	46	46	46	46

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

5 to less than 10 years.

IV. Discussion

Healthcare-associated infections represent the most frequent adverse event affecting hospitalized patients, resulting in increased morbidity and mortality, longer hospital stay, and disability [9]. Invasive procedures increase the risk of infection due to the interruption of the normal barriers [10].

Discussion of the study results will be presented within the following: the sociodemographic characteristics of the nurses. It revealed that the most of nurses 67% age less than 30 years. More than half was female, had nursing diploma 58.7% and 67.4% of them had 5 to less than 10 years.

This is in agreement with Aby, (2015) who pointed that 78.33% of the staff nurses were females and 21.66% of them were aged between 21-30 years. Among the experience categories, 21.66 of the staff nurses had 0-5 year of experience [11]. Same finding by Gijare, (2012) who reported that the majority of the participant 91.59% were female nurses, who were less than 25 years of age, 56.30% were having less than one-year experience, while 30.25% were B.Sc. [12]. El-Sheikh, & Abed-Elsatar, (2011) who reported that 66.7% of nurses were less than 30 years old and 33.3% was from 30 to less than 40 years old [13]. In addition, a study carried out in Zagazig University by Ali, & Taha, (2014) reported that the mean age of nurses was 29.5± 5.76[14]. The most of nurses age 62% was less than 30 years and most of subjects were female

The present study revealed that the most obstacle to implementation infection control was inadequate resources 69.6% and 58.7% overcrowded patients, while the minority 23.9% was unqualified nurses. This is supported by Bialachowski, (2008) who noticed that barriers cited by all participants were role design and lack of resources [16]. A study carried out in Cairo University in 2013 pointed that the most obstacles to apply infection control standards were lack of supplies, shortage of staff [17].

The present study revealed that there was significant improvement in total scores and all items of knowledge and practice regarding infection prevention and control measures before and after applying health education program. While there was no significant difference between immediate after applying health education program and after three months from applying health education program except in practice of gowning, precaution spills pre-cleaning, manual cleaning, and manual disinfecting scores there were significant difference.

This finding is in concordance with Ali, & Taha, (2014) who indicated that there were highly significance differences through phases of study regarding knowledge and practice of universal precaution and endoscopic reprocessing between Pre & Post, Pre & follow up (P=0.0001) among studied nurses [14]. In addition, a study carried out in India by Koshy, & Patel, (2015) who pointed between the posttest and pretest knowledge scores of staff nurses regarding the infection control measures was found to be highly significant (p<0.05) [18].

On the same line with this finding was Maheswari, & Muthamilselvi, (2014) who pointed that over all knowledge posttest mean value 699 and mean percentage 93% are higher than the pretest the mean value 319 and mean percentage 51% [19]. As well Gijare, (2012) who reported that there was a highly significant difference

in the overall knowledge & practice of infection control protocols among nurses during posttest showing that the overall effect of training was good [12].

In this regards a study carried out in Egypt 2010 which demonstrated that there was significant difference between pretest and posttest as regard to the total knowledge score of nurses about infection prevention and control (p

< 0.001). The mean of total score of nurse's knowledge in posttest was higher than pretest this indicated that improvement knowledge of nurse's after the action plan has implemented. There was a statistical significant difference between pre, post, and follow up intervention in relation to universal precaution measures and endoscope reprocessing among nurses except for wearing gloves and eye goggle. This indicates that the implementation of the action plan was very effective in enhancing physician and nurses' knowledge and practice regarding wearing personal protective equipment [13].

Furthermore, there was increases in practice scores at the post-program with statistical significance for nurses' practice about hand washing, gowning, gloving, total universal precautions, and in all practice areas (P. 0.03) [20].

The present study indicates that the most of nurses 67.4% had poor practice before applying health education program and 32.6% of them had fair practice, while immediate after applying health education program the nurses practice was good practice 67.4% and 8.7% of them were poor practice. Moreover, after three months of applying health education program the nurses practice was good practice 76.1% and 6.5% of them were poor practice. The finding is in agreement with Ali, & Taha, (2014) who demonstrated that 7.5% of nurses had satisfactory knowledge before implementation of the infection control training program, 75.0% after implementation program and 67.5% after 6 month of the program implementation (follow-up). In addition, more than half of nurses (85.0%) had unsatisfactory level of practice in the pre infection control training program progress to become (82.5%) of them in the post program had satisfactory practice and persist in the follow-up to become (77.5%) of nurses had high level of practice (p > 0.0001) [14].

As well Thomas. (2012) who demonstrated that 4.4% subjects had poor knowledge, 46.6% subjects had average knowledge, 48.8% subjects had good knowledge and none of the subjects had very good knowledge. In the posttest 65.5% subjects had gained very good level of knowledge, 33.3% subjects gained good level of knowledge, 1.1% subjects gained average level of knowledge, while none had poor knowledge regarding infection control [21].

The present study revealed that there was moderate positive relationship (r=0.40-0.59) between 'pre-intervention and immediate post-intervention' and pre-intervention and post 3 months knowledge, while there was weak relationship (r=0.20-0.39) between Immediate post-intervention and post 3 months knowledge. There was no relationship (negligible) between knowledge and practice before and after intervention were Pearson Correlation Coefficient (r= -0.20- -0.39>0.33). This does not mean that knowledge does not play a role in practice. This could be most likely because of the attitude of nurses towards the practice of infection prevention and control measures.

Gijare, (2012) who reported similar results regarding correlation between knowledge and practice, there was no correlation between pre and posttest knowledge and practice [12]. As well Askarian, McLaws, & Meylan, (2007) who found that there was no correlation between knowledge and practice [22]. Also **(Najeeb & Taneepanichsakul, 2008)** who reported a weak, negative relationship between knowledge and practice regarding infection control among doctors and nurses [23].

On the other hand, there was statistically significant positive correlation was found between knowledge and practice Ndikom, & Onibokun, (2007); Hamid et al, (2010); Eskander, Morsy, & Elfeky, (2013) they revealed statistically significant positive correlation between knowledge and practice of universal precautions

V.   Conclusion

The study concludes that the implementation of planned health education program was effective in improving nurse's knowledge and practice of nurses regarding infection prevention and control measures at endoscopy unit. Planned health education program can be used effectively to improve the knowledge and practice regarding infection prevention and control among the nursing staff. It is a must to keep reinforcing the knowledge and practice regarding infection control.

VI.   Recommendation

All healthcare in the endoscopy units should be trained in, and adhere to standard infection prevention and control. Annual training for all health team members in endoscopy units.

Provide support to help prevent spread of infectious diseases through evidence-based infection control measures in endoscopy unit.

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